

*Note on cobaltiferous Mispickel from Sulitjelma,
Norway.*

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SOME months ago Professor Henry Louis presented to this college several isolated crystals which he had brought from the Sulitjelma (or Sulitelma) mines in Arctic Norway: they occur there in masses of copper-pyrites and iron-pyrites, for which this district has been famed for some years.

The crystals are of various sizes, ranging in length from 4 to 8 mm. They have a metallic lustre and silver-white colour. The fracture is uneven, and no cleavage is visible. On a freshly broken surface small yellow particles can be seen with the naked eye; these also have a metallic lustre, and are probably iron-pyrites, a probability which is strengthened by the appended chemical analysis. The specific gravity varies from 5.94 to 6.02, and the hardness is just under 5. The crystals are all of a pronounced rhombic aspect. Three of them were measured, and the forms present were found to be {011}, {012}, and {110}; the faces of the forms {011} and {012} are faintly striated parallel to their edges of intersection.

Two of the measured crystals are simple, and the third is a composite growth of two interpenetrant individuals. This latter approximates to a twin, of which the twin-plane is (210); but it is only approximation, the difference between the observed and calculated angles being too large to justify the recognition of a new twin-plane, especially as this relation of the individuals was only found in a single instance.

The means of the best readings of the angles of the simple crystals are the following:—

			Measured.		Calculated.
(011) : (011)	...	...	80° 0½'	...	—
(011) : (012)	...	...	19 16½	...	19° 12½'
(012) : (012)	...	...	61 37	...	61 34
(110) : (110)	...	...	69 6	...	—

From the above angles we derive the axial ratios:—

$$a : b : c = 0.6886 : 1 : 1.1915.$$

These axial ratios suggested that the specimens are crystals of glaucodote; but the following two analyses by Dr. J. A. Smythe, of the Durham College of Science, show that the material is mispickel, containing about one per cent. of cobalt and thus approaching to the variety known as danaite.

	I.	II.	Mean.	Atomic ratios.
S	21.76 ...	21.96 ...	21.86 ...	0.683
As	42.20 ...	42.15 ...	42.18 ...	0.562
Fe	35.31 ...	36.17 ¹ ...	35.31 ...	0.632
Co	1.32 ...	0.98 ...	1.15 ...	0.020
	100.59	101.26	100.50	

The atomic ratios show an excess of iron (0.090) and a still greater excess of sulphur (0.121) over that required by the formula $(\text{Fe}, \text{Co})\text{AsS}$; this is probably owing to the mechanical intermixture of iron-pyrites, yellow specks of which on the fractured surface are visible to the naked eye.

It remains to be mentioned that crystals of cobaltiferous mispickel (danaite) from Sulitjelma were described by Professor A. W. Stelzner in 1891²: these were a centimetre in length, showed the forms {110}, {011}, {012}, and contained 6.81 per cent. of cobalt.

¹ Dr. Smythe remarks that in the method adopted in the second analysis there was a risk of insufficient washing, so that the lower figure for the iron is likely to be the more correct.

² A. W. Stelzner, 'Die Sulitjelma-Gruben im nördlichen Norwegen. Nach älteren Berichten und eigenen Beobachtungen besprochen,' Freiberg (Saxony), 1891. Stelzner's results are quoted by J. H. L. Vogt in *Zeits. prakt. Geol.*, 1894, p. 48; and in Hintze's 'Handbuch d. Mineralogie,' 1901, vol. i, p. 863.